# Saia® Energimätning
3-fas

4.3 **Saia® energy meter –**
small, robust, reliable and accurate

Their very compact construction makes the Saia® energy meters ideally suited for housing a large number of measurement devices in the smallest of spaces. The small dimensions make it possible to retrofit the meter in existing switch cabinets without having to install new switch cabinets. The robust construction has proven itself in harsh industrial conditions. The energy meter is specially designed for such applications, which is reflected in its high level of reliability and long-term stability. The production site in Murten, Switzerland, guarantees the high quality of the energy meters. The display indicates the energy, electricity, voltage and active output.
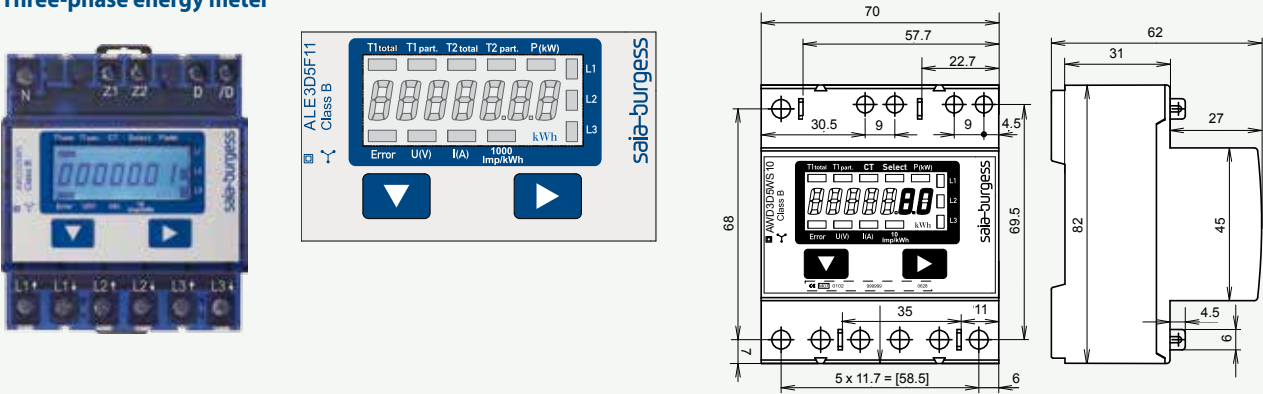
Many Saia® energy meters are installed in the smallest of spaces ▶

Single-phase energy meter
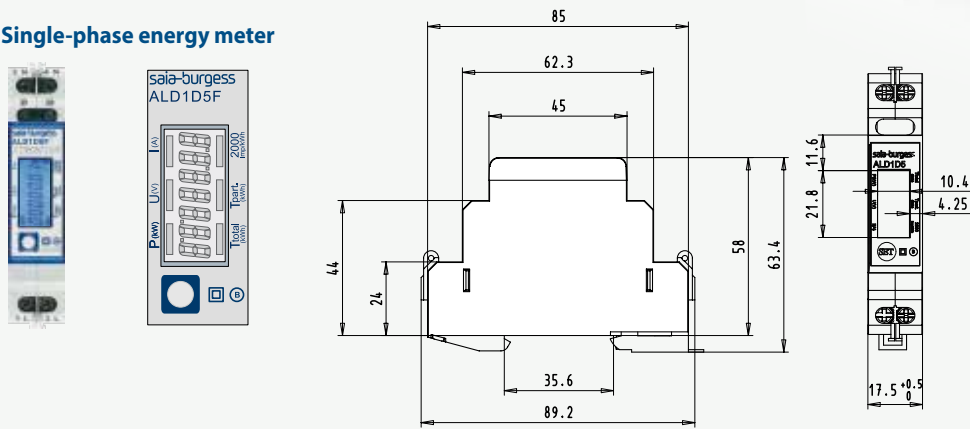
Three-phase energy meter

More details on the display:
Webcode scen13120

Overview of Saia® energy meters

	Single-phase				Three-phase				
	Direct measurement 0.25…32 A		Transformer connection up to 500:5 A		Direct measurement 0.5…65 A		Transformer connection up to 1500 A		up to 300:1 A
Interface	Unidirectional	Bidirectional	Unidirectional	Bidirectional	Unidirectional	Bidirectional	Unidirectional	Bidirectional	Unidirectional
M-Bus	ALD1D5FM…	---	---	---	ALE3D5FM…	---	AWD3D5WM…	---	---
Modbus	ALD1D5FD…	---	---	---	ALE3D5FD…	---	AWD3D5WD…	---	---
Saia® S Bus	ALD1D5FS…	ALD1B5FS…	AWD1D5WS…	---	ALE3D5FS…	ALE3B5FS…	AWD3D5WS…	AWD3B5WS…	AWC3D5WS…
S0-Interface	ALD1D5F1…	ALD1B5F1…	AWD1D5W1…	---	ALE3D5F1…	ALE3B5F1…	AWD3D5W1…	AWD3B5W1…	---

## 4.3.1 General information on the Saia® energy meters

Reliability directly from the factory

The energy meters are designed and produced in Murten so that the meters prove their high level of reliability and long-term stability even under extreme industrial conditions. The high quality standards of the Swiss production facility guarantee a high level of accuracy and enable the production of MID approved electrical energy meters which are guaranteed ex works for the entire calibration period. This approval means the measured values are completely reliable and can be used for billing purposes throughout Europe.

Find out more about MID here: Webcode scen13121a

▲ Energy meter in a harsh industrial environment
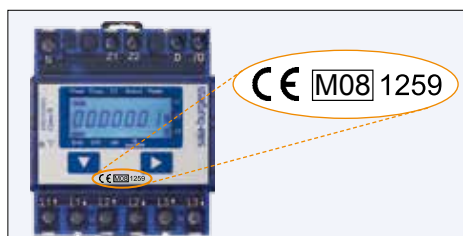
▲ MID meter marking

▲ Energy meter production cell in Murten

Meter for converter connection

The use of current transformers makes the costly disconnection of entire machines for the installation of the meters unnecessary. Replacing an energy meter or current transformer while a machine is running is possible with the specific use of single-phase transformers as the missing parts can be easily exchanged without the need to disconnect the entire machine from the power supply.

More information on the subject of current transformers can be found here: Webcode scen13121b

Available transformer ratios for Saia® energy meters

Single-phase alternating current energy meter				Three-phase rotary energy meter 5A sec. Current				Three-phase rotary energy meter 1A sec. Current			
5:5	50:5	100:5	200:5	5:5	50:5	100:5	150:5	1:1	10:1	20:1	30:1
250:5	300:5	400:5	500:5	200:5	250:5	300:5	400:5	40:1	50:1	60:1	80:1
---	---	---	---	500:5	600:5	750:5	1000:5	100:1	120:1	150:1	200:1
---	---	---	---	1250:5	1500:5	---	---	250:1	300:1	---	---

▲ Current transformer in control cabinet
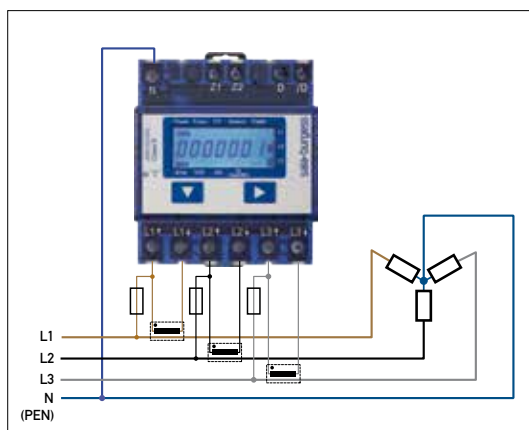
L1
L2
L3
N
(PEN)
▲ Connected Saia® converter energy meter

▲ Built-in current transformer in cable duct

MTBF values for Saia® energy meters

The quality, robustness and reliability of the Saia® energy meters are also reflected in the MTBF values which are calculated according to the Siemens SN29500 standard.

MTBF values at 25 °C:

Energy meter without communication interface: 410 years

Energy meter with communication interface: 200 years

Detailed description of the MTBF values: Webcode scen13121c

Side tabs:
1 Automation stations
2 HMI Visualization and operating
3 Dedicated room controller
4 Consumption data acquisition
5 Cabinet components

Measuring energy in both directions

Bidirectional energy meters can be used to measure the energy in both current directions. The Saia® energy meters work accumulatively (Mode 2) which means they calculate the sum of all measured phase outputs analogously to the old Feraris meter with a rotating disc.

Bidirectional meters are most often used wherever both energy flow directions (energy supply and feed) occur, e.g. in photovoltaic systems. FBoxes exist for connecting to the PCD world to simplify the acquisition of measured values. The connection to the EnergyManager can be carried out without any additional manipulation.

Find out more about the bidirectional energy meter by following this link:
Webcode scen13122

▲ Measure energy in both directions using a Saia® PCD for the subsequent processing of the measured values.
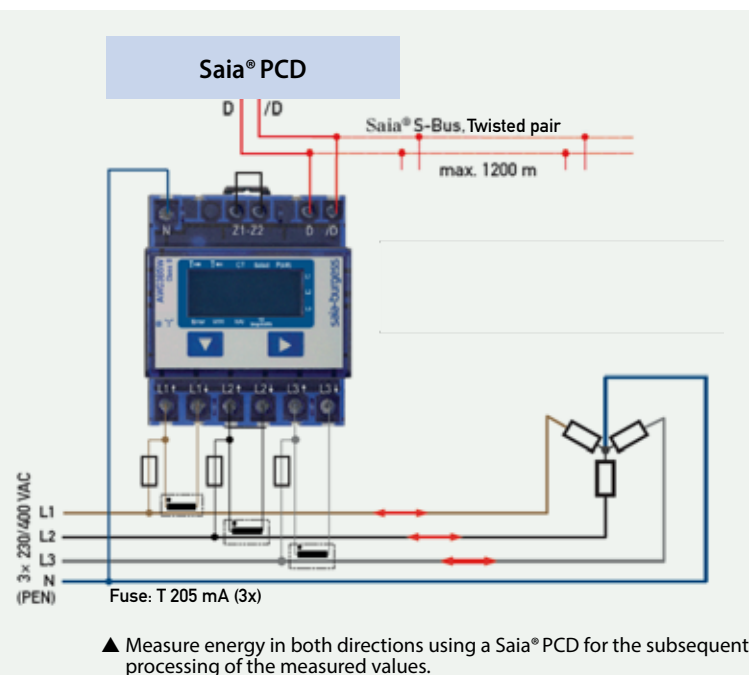
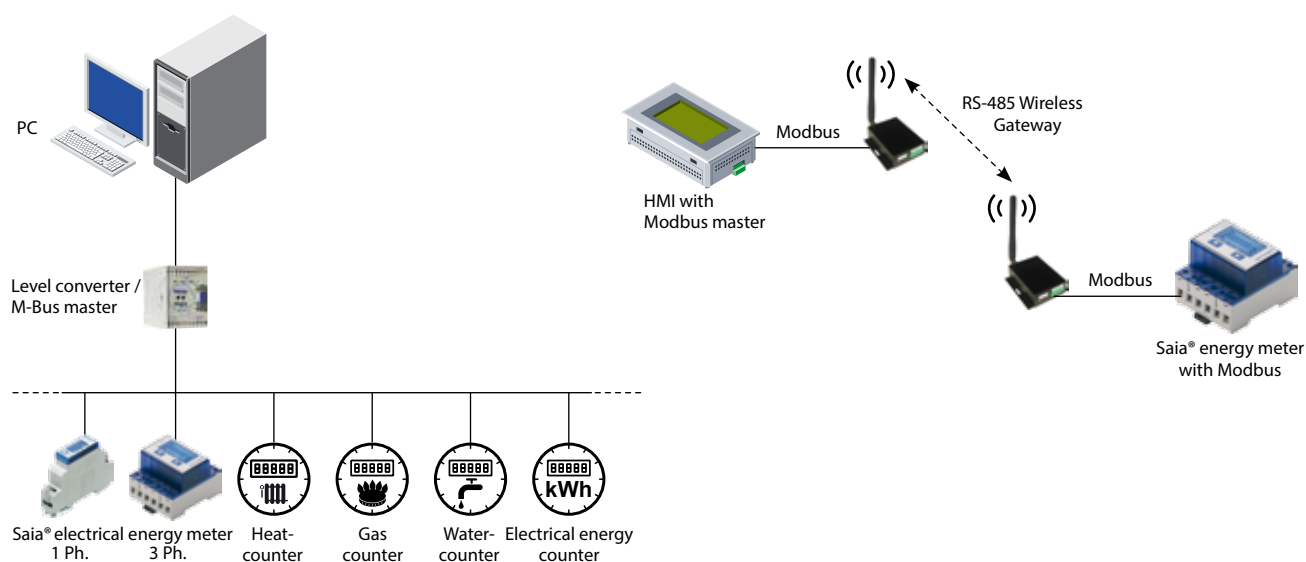**EPLAN macros are available for project planning and engineering purposes**

An update of the macros and product data for the eplan® electric P8 and their availability on the eplan® Data Portal is under development.

Under development, see chapter C2 "Product status"

Energy meters as components without Saia®Automation

The Saia® M-bus energy meters can be integrated in all M-Bus systems and read by every M-Bus master. This makes it possible to use them in existing machines with an existing M-Bus infrastructure or in new projects with various other M-Bus components.
The Saia® energy meters with integrated serial Modbus RTU interface enable high-speed secure communication with higher level systems. There are many components for data transfer, backups and the visualisation of the measured data available on the market. Thanks to this great variety, it is easy to integrate via a wide range of transmission paths. The Modbus can be used to make use of existing equipment without the need to acquire new items.

PC

Level converter / M-Bus master

Saia® electrical energy meter 1 Ph.

Saia® electrical energy meter 3 Ph.

Heat-counter

Gas counter

Water-counter

Electrical energy counter

HMI with Modbus master

Modbus

RS-485 Wireless Gateway

Modbus

Saia® energy meter with Modbus

4.3.2 **Saia® energy meters with Saia® S-Bus interface**

The energy meter with integrated Saia® S-Bus interface provides all relevant data such as energy, electricity, voltage, output (active and reactive) and cosφ, which can be read via the bus connection. The serial Saia® S-Bus interface (based on RS-485) can be directly connected to the Saia® device family. Pre-assembled FBoxes are available free of charge for the connection to each type of meter. Bidirectional Saia® S-Bus energy meters are also available. The Bus address can be set on the display, and the energy, electricity, voltage and active output can also be read directly off it.

Connection diagram for Saia® S-Bus energy meters
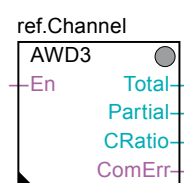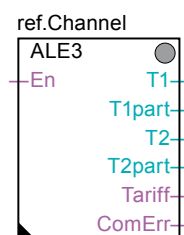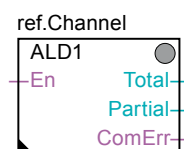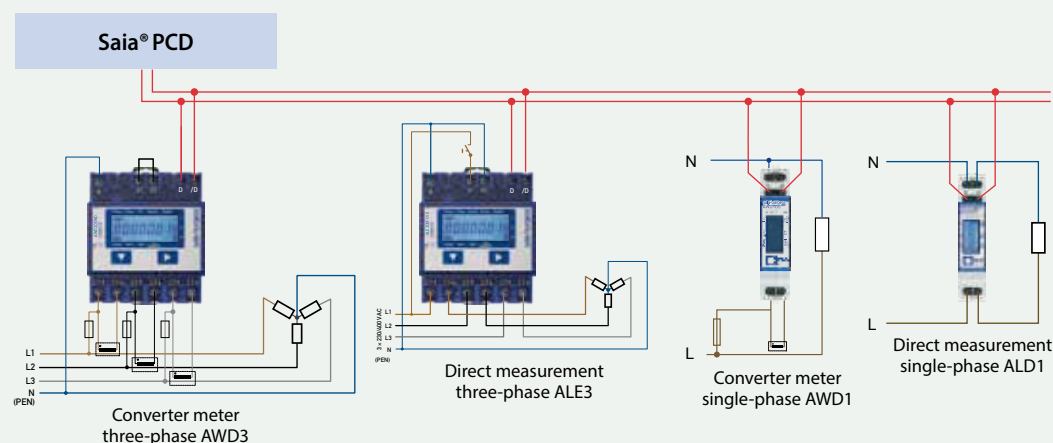
FBoxes are available for every type of Saia® S-Bus meter.

Technical data

S-Bus

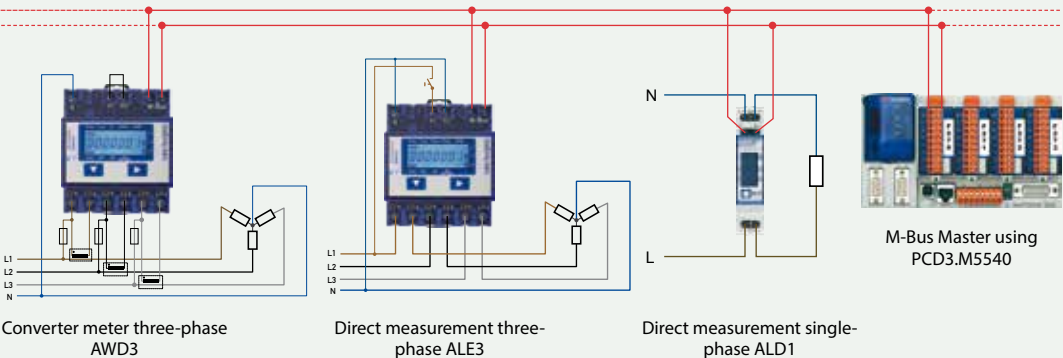| Bus system	Serial RS-485 interface
Log	Saia® S-Bus Data Mode
Transmission rate	2 400-4 800-9 600-19 200-38 400-57 600-115 200 Baud. The transmission rate is detected automatically.
Bus length (maximum)	1 200 m (without repeater)
Response time:	Writing: up to 60 ms Reading: up to 60 ms

		ALD1 / AWD1					ALE3				AWD3 / AWC3				
		ALD1D5FS00A2A00	ALD1B5FS00A2A00	ALD1D5FS00A3A00	ALD1B5FS00A3A00	AWD1D5WS00A2A00	ALE3D5FS10C2A00	ALE3B5FS00C2A00	ALE3D5FS10C3A00	ALE3B5FS00C3A00	AWD3D5WS00C2A00	AWD3B5WS00C2A00	AWD3D5WS00C3A00	AWD3B5WS00C3A00	AWC3D5WS00C2A00
Tariff	1 tariff	●	●	●	●	●	---	●	---	●	●	●	●	●	●
	2 tariffs	---	---	---	---	---	●	---	●	---	---	---	---	---	---
Meter type	Unidirectional design	●	---	●	---	●	●	---	●	---	●	---	●	---	●
	Bidirectional design	---	●	---	●	---	---	●	---	●	---	●	---	●	---
Approvals	with MID	---	---	●	●	---	---	---	---	---	---	---	●	●	---
	without MID	●	●	---	---	●	●	●	---	---	●	●	---	---	●
Nominal/Max. power	$I_{min} = 0.01$ A, $I_N = 1$ A, $I_{max} = 1{,}2$ A	---	---	---	---	---	---	---	---	---	---	---	---	---	●
	$I_{min} = 0.05$ A, $I_N = 5$ A, $I_{max} = 6$ A	---	---	---	---	●	---	---	---	---	●	●	●	●	---
	$I_{min} = 0.25$ A, $I_N = 5$ A, $I_{max} = 32$ A	●	●	●	●	---	---	---	---	---	---	---	---	---	---
	$I_{min} = 0.50$ A, $I_N = 10$ A, $I_{max} = 65$ A	---	---	---	---	---	●	●	●	●	---	---	---	---	---
Measurement type	Direct measurement	●	●	●	●	---	●	●	●	●	---	---	---	---	---
	Conversion up to 300 A	---	---	---	---	---	---	---	---	---	---	---	---	---	●
	Conversion up to 500 A	---	---	---	---	●	---	---	---	---	---	---	---	---	---
	Conversion up to 1500 A	---	---	---	---	---	---	---	---	---	●	●	●	●	---
Operating voltage	230 VAC, 50 Hz	●	●	●	●	●	---	---	---	---	---	---	---	---	---
	3 × 230/400 VAC, 50 Hz	---	---	---	---	---	●	●	●	●	●	●	●	●	●
Partial meter	Resettable	●	---	●	---	---	●	●	●	●	●	---	●	---	●

4.3.3 Saia® energy meters with M-Bus interface

The M-Bus interface allows every Saia® PCD or any M-Bus master to connect and read measurement data.
The meters comply with the M-Bus standard EN13757. Pre-assembled FBoxes are available for the connection to the Saia® PCD systems and are free of charge for Saia® energy meters. The relevant measurement data such as energy, electricity, voltage and output (active and reactive) can be read via the M-Bus interface. The Bus address can be set on the display, and the energy, electricity, voltage and active output can also be read directly off it.

Connection diagram for M-Bus energy meters

Converter meter three-phase AWD3

Direct measurement three-phase ALE3

Direct measurement single-phase ALD1

M-Bus Master using PCD3.M5540

FBoxes are available for every type of Saia® M-Bus energy meter.

Technical data

M-Bus

Bus system	M-Bus
Transmission rates (bit/s)	300, 2400, 9600 Baud. The transmission rate is detected automatically.
Bus length (max.)	as per M-Bus specifications
Response time:	Writing: up to 60 ms Reading: up to 60 ms

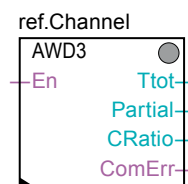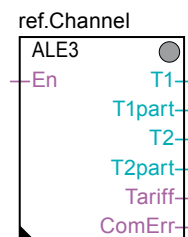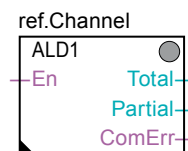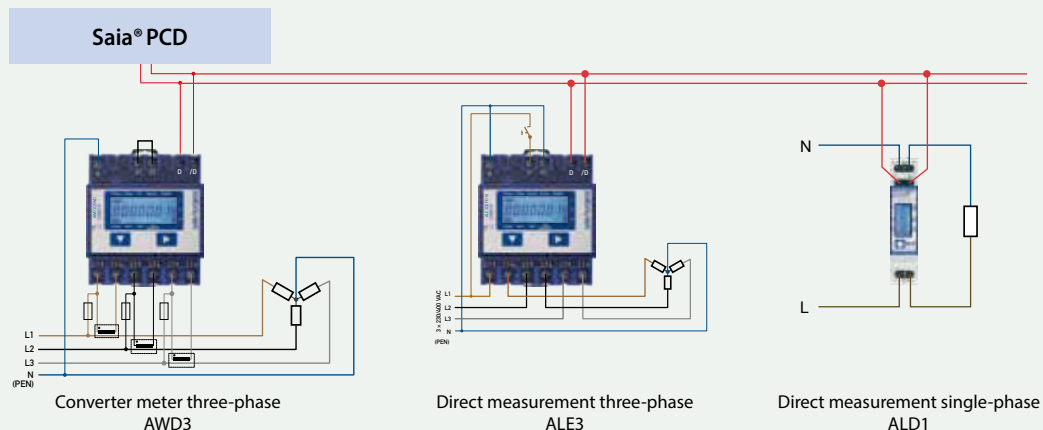|		ALD1		ALE3		AWD3	
		ALD1D5FM00A2A00	ALD1D5FM00A3A00	ALE3D5FM10C2A00	ALE3D5FM10C3A00	AWD3D5WM00C2A00	AWD3D5WM00C3A00
Tariff	1 tariff	●	●	---	---	●	●
	2 tariffs	---	---	●	●	---	---
Approvals	with MID	---	●	---	●	---	●
	without MID	●	---	●	---	●	---
Nominal/Max. power	$I_{min} = 0.05$ A, $I_N = 5$ A, $I_{max} = 6$ A	---	---	---	---	●	●
	$I_{min} = 0.25$ A, $I_N = 5$ A, $I_{max} = 32$ A	●	●	---	---	---	---
	$I_{min} = 0.50$ A, $I_N = 10$ A, $I_{max} = 65$ A	---	---	●	●	---	---
Measurement type	Direct measurement	●	●	●	●	---	---
	Conversion up to 1500 A	---	---	---	---	●	●
Operating voltage	230 VAC, 50 Hz	●	●	---	---	---	---
	3 × 230/400 VAC, 50 Hz	---	---	●	●	●	●
Partial meter	Resettable	●	●	●	●	●	●

4.3.4 Saia® energy meters with Modbus interface

The integrated Modbus RTU interface complies with the IDA specification and is based on an RS-485 interface. The energy meter measurement data can be connected to any Modbus master to read the measured values. The relevant measurement data such as energy, electricity, voltage and output (active and reactive) and cosφ can be read via the interface. The Bus address can be set on the display, and the energy, electricity, voltage and active output can also be read directly off it.

Pre-assembled FBoxes are available for connecting the Saia® energy meter to the Saia® PCD systems and are free of charge.

Connection diagram for Modbus energy meters

Converter meter three-phase
AWD3

Direct measurement three-phase
ALE3

Direct measurement single-phase
ALD1

FBoxes for every type of Saia® M-Bus energy meter

Technical data

Modbus

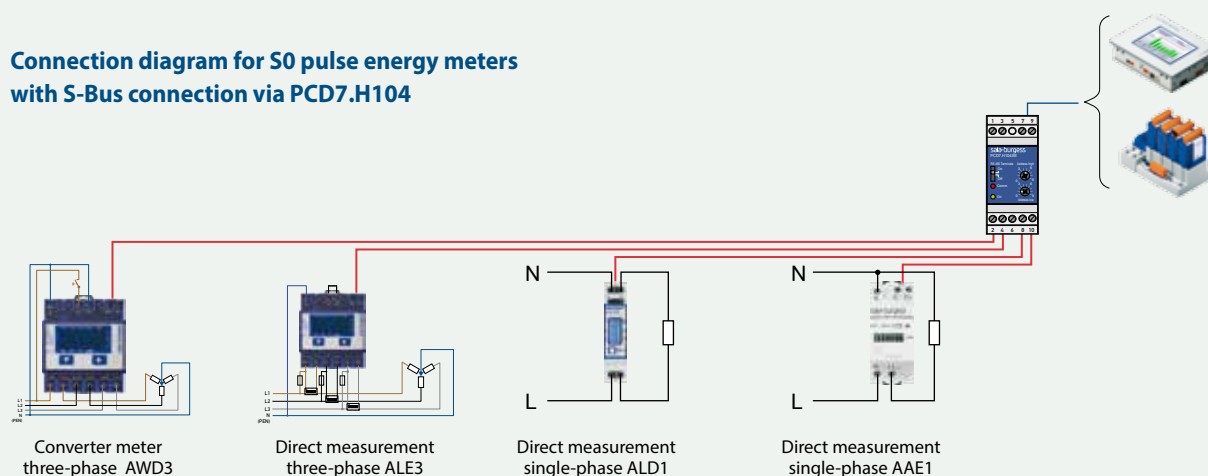|	
Log	Modbus RTU as per IDA specification
Bus system	Serial RS-485 interface
Transmission rates (bit/s)	2 400-4 800-9 600-19 200-38 400-57 600-115 200 Baud. The transmission rate is detected automatically.
Bit settings	8 data bits, even parity*, 1 stop bit
Bus cable	Twisted, shielded, 2 × 0.5 mm², max 1 200 m
Response time:	Writing: up to 60 ms Reading: up to 60 ms

*all parities in preparation, see section C2 «Status»

		ALD1		ALE3		AWD3	
		ALD1D5FD00A2A00	ALD1D5FD00A3A00	ALE3D5FD10C2A00	ALE3D5FD10C3A00	AWD3D5WD00C2A00	AWD3D5WD00C3A00
Tariff	1 tariff	•	•	---	---	•	•
	2 tariffs	---	---	•	•	---	---
Approvals	with MID	---	•	---	•	---	•
	without MID	•	---	•	---	•	---
Nominal/Max. power	$I_{min} = 0.05$ A, $I_N = 5$ A, $I_{max} = 6$ A	---	---	---	---	•	•
	$I_{min} = 0.25$ A, $I_N = 5$ A, $I_{max} = 32$ A	•	•	---	---	---	---
	$I_{min} = 0.50$ A, $I_N = 10$ A, $I_{max} = 65$ A	---	---	•	•	---	---
Measurement type	Direct measurement	•	•	•	•	---	---
	Conversion up to 1500 A	---	---	---	---	•	•
Operating voltage	230 VAC, 50 Hz	•	•	---	---	---	---
	3 × 230/400 VAC, 50 Hz	---	---	•	•	•	•
Partial meter	Resettable	•	•	•	•	•	•

Automation stations 1

HMI Visualization and operating 2

Dedicated room controller 3

Consumption data acquisition 4

Cabinet components 5

4.3.5 Saia® energy meters with S0 pulse output

Energy meters with an integrated S0 interface enable the transmission of the measured energy via pulses to the Saia® PCD family of devices and the EnergyManager. The PCD7.H104 coupler module can be used to request the pulses via the RS-485 interface (Saia® S-Bus or Modbus)

Connection diagram for S0 pulse energy meters with S-Bus connection via PCD7.H104

Converter meter three-phase AWD3 • Direct measurement three-phase ALE3 • Direct measurement single-phase ALD1 • Direct measurement single-phase AAE1

		ALD1				AAE1	ALE3					AWD3			
		ALD1D5F10KA2A00	ALD1B5F10KA2A00	ALD1D5F10KA3A00	ALD1B5F10KA3A00	AAE1D5F10KR3A00	ALE3D5F10KA2A00	ALE3B5F10KC2A00	ALE3D5F11KC3A00	ALE3D5F10KA3A00	ALE3B5F10KC3A00	AWD3D5W10MC2A00	AWD3B5W10MC2A00	AWD3D5W10MC3A00	AWD3B5W10MC3A00
Tariff	1 tariff	•	•	•	•	•	•	•	---	•	•	•	•	•	•
	2 tariffs	---	---	---	---	---	---	---	•	---	---	---	---	---	---
Meter type	Unidirectional design	•	---	•	---	•	•	---	•	•	---	•	---	•	---
	Bidirectional design	---	•	---	•	---	---	•	---	---	•	---	•	---	•
Approvals	with MID	---	---	•	•	•	---	•	•	•	•	---	---	•	•
	without MID	•	•	---	---	---	•	---	---	---	---	•	•	---	---
Nominal/ Max. power	$I_{min} = 0.05$ A, $I_N = 5$ A, $I_{max} = 6$ A	---	---	---	---	---	---	---	---	---	---	•	•	•	•
	$I_{min} = 0.25$ A, $I_N = 5$ A, $I_{max} = 32$ A	•	•	•	•	---	---	---	---	---	---	---	---	---	---
	$I_{min} = 0.50$ A, $I_N = 10$ A, $I_{max} = 65$ A	---	---	---	---	•	•	•	•	•	•	---	---	---	---
Measurement type	Direct measurement	•	•	•	•	•	•	•	•	•	•	---	---	---	---
	Conversion up to 1500 A	---	---	---	---	---	---	---	---	---	---	•	•	•	•
Operating voltage	230 VAC, 50 Hz	•	•	•	•	•	---	---	---	---	---	---	---	---	---
	3 × 230/400 VAC, 50 Hz	---	---	---	---	---	•	•	•	•	•	•	•	•	•
S0-output	1000 pulses/kWh	•	•	•	•	•	•	•	•	•	•	---	---	---	---
	10 Imp./kWh	---	---	---	---	---	---	---	---	---	---	•	•	•	•
Partial meter	Resettable	•	---	•	---	---	•	•	---	•	---	•	---	•	---

4.3.6 Saia® energy meter – sealing cap

Accessories	Order no.

4 104 7420 0

Lead sealing cap for single-phase energy meters ALD1 and AWD1

A quantity of 2 is recommended for protection against accidental contact

(also applies to the termination boxes PCD7.T161 and PCD7.T162, see chapter 6.3)

ALD1, AWD1 with mounted sealing cap

4 104 7485 0

Sealing cap for

– **single-phase energy meter AAE1**

– **three-phase energy meters ALE3, AWC3 and AWD3**

A quantity of two recommended for protection against accidental contact for AAE1

A quantity of four is recommended for protection against accidental contact for ALE3, AWC3 and AWD3

ALE3, AWC3 or AWD3 with sealing cap

4.3.7 Application Notes

Application notes on the subject of energy can been found by searching using the application notes tag in YouTube.

Subject: Network faults
What are the usual faults experienced by energy meters in real measurement environments?
Webcode scen13127a

Subject: Current transformer
There are many types of current transformer. The use of energy meters with current transformers can involve some pitfalls of which you should be aware.
Webcode scen13127b

1 Automation stations

2 HMI Visualization and operating

3 Dedicated room controller

4 Consumption data acquisition

5 Cabinet components